REMARKS

Claims 1 and 10 were rejected under 35 U.S.C. §102(b) as being anticipated by US Pat. 5,720,291 (Schwartz) which was cited by applicants. Claims 1 and 10 have been amended to more clearly define the present invention.

Amended Claim 1 describes a method of simultaneously displaying a parametric diagnostic image and an anatomical diagnostic image of the region of interest corresponding to the parametric diagnostic image, comprising acquiring an anatomical flow image of a region of interest of a subject comprising tissue containing blood flow; acquiring a parametric image of the region of interest of the subject; and displaying the parametric image in anatomical registration with the anatomical flow image, wherein the relative opacity of the registered parametric image and anatomical flow image is variable. The present invention solves two problems, one of which is correlating for the clinician a parametric image to the tissue and blood flow to which the parameters of the image relate. The other problem solved is doing this in an anatomically visual manner, as the two images are of the same anatomy and simply overlaying the two images would cover the underlying image. These problems manifest themselves with both 2D and 3D anatomical comparisons. As shown in Figs. 15A-15E of the present application, by enabling the clinician to vary the opacity of one or both of the anatomically registered images, the clinician can fade back and forth between an image of the tissue and blood flow and an image of the parameter in registration therewith, or a combination of the two. The clinician can thus see a defect such as a perfusion anomaly in the perfusion image and immediately fade to the corresponding tissue to quickly identify and confirm an infarcted region of the myocardium, for instance.

The Schwartz patent is not trying to solve this problem. He is solving a problem which is found in 3D imaging, which is that when a volume of tissue and blood vessels is imaged in 3D, the opacity of the tissue means that all that is seen are the surfaces of the outside of the tissue volume. See, for example, Figs. 21-27 of US Pat. 5,454,371 (Fenster et al.) These figures are of 3D ultrasound volumes which show that normally only the outside of the volume is visible; the interior is obscured by the tissue. If the clinician desires to diagnose anatomy inside the volume, she is limited to acquiring a volume with the anatomy of interest on the surface of the volume, or "slicing" through the volume by image processing until the anatomy of interest is located and displayed. Schwartz solves this problem by acquiring the blood flow and tissue images separately, then merging them together in volume rendering but allowing the clinician to vary the opacity of the tissue and the blood flow

separately. This enables the clinician to adjust the tissue opacity so that the tissue is presented semi-transparently so that the clinician can "see through" the tissue and observe the interior blood flow. Alternately, the semi-transparent rendering of the tissue enables the clinician to discern different tissue textures inside the volume so that the clinician can distinguish the vasculature of the placenta from the vasculature of the uterine wall, for example. By varying the opacity controls the clinician can see either the blood flow inside the tissue, or the tissue surrounding the vasculature, or a combination of the two. The problem solved by Schwartz is particular to 3D imaging. When 2D images are used the obscuring problem does not occur, as the imaged tissue and blood flow is all in one plane and the tissues and blood vessels are next to each other in the plane, not obscuring each other.

In the present invention the anatomical flow image is of tissue containing blood flow. The second image, the parametric image, is of a parameter which anatomically relates to the same region, as the claims state. They are not of tissue and adjacent blood vessels as is the case in a standard 2D image or in the volumetric regions of Schwartz. This means that, when the anatomical flow image and the parametric image are anatomically registered, the one on top will cover the one below. In the prior art, as exemplified in the parent application, now US Pat. 6,692438 (cited by applicants), one could produce a parametric image as shown in Fig. 13B. The parametric image could then be viewed side-by-side with an anatomical image of the tissue to relate the two, which is less than ideal for making a precise diagnosis. The present invention solves this problem by allowing the two to be anatomically registered, then allowing the opacity to be varied so that, without averting her eyes, the clinician can quickly fade back and forth between the anatomical image, the flow image, or one which shows exactly which part of the anatomy is exhibiting a certain parametric characteristic.

There are numerous differences between the present claimed invention and what Schwartz is doing. Schwartz is working with two types of images, tissue images and blood flow images. The anatomical image of the present invention comprises tissue containing blood flow, and the parametric image is an anatomical arrangement of parameters of the region. The parameter could be of tissue motion, for example, or of tissue perfusion as another example. The two images are of the same region, not of adjacent or different regions, which means that the problem solved will exist in both 2D and 3D imaging. The claimed invention gives an immediate correlation of afflicted tissue and the parametric characteristic of the affliction, such as an infarcted tissue and its perfusion characteristic.

For these reasons it is respectfully submitted that Claim 1 and its dependent Claims 2-9 cannot be anticipated by Schwartz.

Amended Claim 10 describes a diagnostic imaging system for displaying a parametric image in anatomical registration with an anatomical flow image of a region of interest of a subject comprising a source of diagnostic flow images of a region of interest of a subject comprising tissue containing blood flow; a source of parametric images of the region of interest of the subject; a display coupled to the source of diagnostic flow images and the source of parametric images which displays a diagnostic flow image and a corresponding parametric image of the same region in anatomical registration; a display processor coupled to the display which acts to set the relative opacity of the registered diagnostic flow image and parametric image; and a user control, coupled to the display processor, by which a user can set the relative opacity of the registered diagnostic flow image and parametric image. An imaging system of Claim 10 enables a user to vary a user control which fades an anatomically registered image containing tissue and flow, on the one hand, and a parametric image of the same region, on the other, back and forth so that the user can immediately see the correspondence between the tissue and blood flow and their parametric differences. Afflicted anatomy can be spotted and confirmed virtually at once. Schwartz is working with tissue images, on the one hand, and blood flow images on the other. The present invention uses images comprising tissue containing blood flow, on the one hand, and parametric images on the other. The two images of the present invention are of the same region, not separate or adjacent anatomies. An embodiment of Claim 10 performs anatomical registration of an image of tissue and blood flow and a corresponding parametric image of the same region, then allows the user to see one or the other or both in anatomical registration, even though they are of the same region and would normally cover each other. For these reasons it is respectfully submitted that Schwartz cannot anticipate amended Claim 10 and its dependent Claims 11-19.

Claims 2-19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Schwartz in view of US patent pub. 2004/0254440 (Pedrizzetti et al.) Pedrizzetti et al. was cited for its teaching of the creation of a parametric image. Pedrizzetti et al. gathers a sequence of images of their target anatomy such as the myocardium as they illustrate. Since the heart is always moving and they want pixel-to-pixel alignment, Pedrizzetti et al. discuss several ways of aligning they myocardial tissue in paragraph [0076]. (Today's ultrasound systems do this by what is known as "speckle tracking.") They then compute a perfusion parameter from aligned, temporally different pixel values using the curve-fitting equation in

paragraph [0080]. "As a last step" they form a parametric perfusion image as described in paragraph [0084].

The formation of parametric images by Pedrizzetti et al. is no different than the formation of parametric images described in the parent application serial number 10/025,200, now US Pat. 6,692,438 of record in this case. In that patent two of the present applicants describe the formation of parametric images using the same curve-fitting equation (col. 6) through aligned, temporally different pixels (Fig. 10) to produce the same parametric image of the myocardium. Compare Fig. 13B of the '438 patent with Fig. 9 of Pedrizzetti et al. The problem then arises, how to relate the perfusion information of the parametric image with the anatomy to which it relates? Applying Schwartz's opacity variation will only cause the perfusion image to become fainter or brighter. The solution of Pedrizzetti et al. is to compare the perfusion image with a perfusion image of a different patient and/or different tissues (paragraphs [0044] and [0087]), which still does not correlate the perfusion information with the blood flow and tissue to which it relates. What is still missing from the combination of Schwartz and Pedrizzetti et al. is to acquire a second, anatomical image of the tissue and blood flow of the same region as the parametric image, display the anatomical image and the parametric image in anatomical registration, then provide opacity control which enables the user to fade between one and the other while the two images are in anatomical registration. These elements are found in the independent Claims 1 and 10. It is respectfully submitted that these missing elements prevent the combination of Schwartz and Pedrizzetti et al. from rendering Claims 2-19 unpatentable.

In view of the foregoing amendment and remarks, it is respectfully submitted that Claims 1 and 10 cannot be anticipated by Schwartz, and that Claims 2-19 are patentable over the combination of Schwartz and Pedrizzetti et al. Accordingly it is respectfully requested that the rejection of Claims 1 and 10 under 35 U.S.C. §102(b) and of Claims 2-19 under 35 U.S.C. §103(a) be withdrawn.

In light of the foregoing amendment and remarks, it is respectfully submitted that this application is now in condition for allowance. Favorable reconsideration is respectfully requested.

Respectfully submitted,

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